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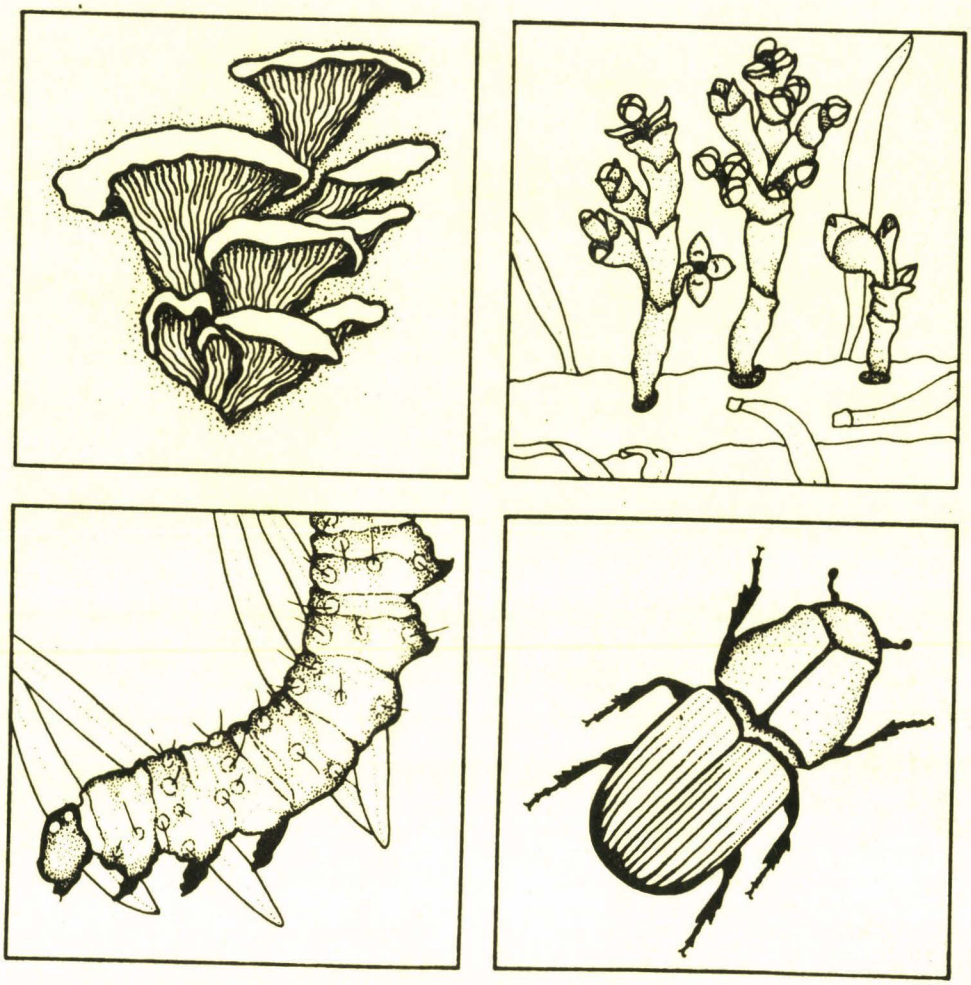
MONTANA
FOREST PEST CONDITIONS
AND PROGRAM HIGHLIGHTS

1985

REPORT 86-2

JULY 1986



United States Department of Agriculture
Forest Service Northern Region

Montana Department of State Lands
Division of Forestry

MONTANA FOREST PEST CONDITIONS AND PROGRAM HIGHLIGHTS

1985

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Report 86-2

May 1986

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INTRODUCTION

This report has been jointly prepared by the Montana Department of State Lands, Forestry Division, and the USDA Forest Service, Cooperative Forestry and Pest Management staff. A similar report for Idaho has been prepared by the Idaho Department of Lands and the USDA Forest Service.

This report summarizes the results of aerial and ground surveys and associated activities conducted during 1985. Major insect and disease damage on forested lands of all ownerships within the State is described. Area infested, growth loss, and mortality have been estimated.

SUMMARY OF CONDITIONS

The insects and diseases that caused widespread economic losses in Montana's forests in 1985 included mountain pine beetles, western spruce budworm, root diseases, and dwarf mistletoes. The mountain pine beetle outbreak that began in the early 1970's continued in 1985. Overall, the area of lodgepole pine on all ownerships infested by the insect declined from 1.2 million acres in 1984 to 0.8 million acres in 1985. However, significant losses occurred at many Montana locations and the outbreak continued to build on the Kootenai and Flathead National Forests and nearby State and private lands. Area defoliated by western spruce budworm increased from 2.3 million acres in 1984, to 2.7 million acres in 1985. Most of the affected lands were in forests east of the Continental Divide. Root diseases, mainly Armillaria root disease and yellow laminated root rot, were of concern on about 1.3 million acres. They were most damaging to Douglas-fir and grand fir forests west of the Continental Divide. Dwarf mistletoes, like root diseases, do not fluctuate greatly from year to year, but their chronic effects on stand growth are large. They infested about 2.4 million acres in Montana.

Insects and diseases that caused significant damage in localized areas included spruce beetle, pine engraver beetle, pine needle sheathminer, larch budmoth, western pine tip moth, white pine blister rust, stem rusts of hard pines, and nursery diseases.

Montana experienced a severe drought during the spring and early summer of 1985. Precipitation for June and July was near or below record lows. Although August precipitation set a record high, the effects of the spring drought could be seen in late summer. Effects included widespread mortality of Douglas-fir and ponderosa pine seedlings and saplings at a number of locations, especially on south- and west-facing slopes. Also observed was an increase in fir engraver beetle-caused mortality in the western river valleys. Increased mortality, especially that caused by pine engraver beetles, but also other pests including root diseases, is expected to be apparent on 1986 aerial surveys.

DISEASES

Root diseases, dwarf mistletoes, stem rusts, and decays are the most damaging classes of forest diseases in Montana. Damage from these pests does not fluctuate greatly from year to year. Nevertheless, the long-term losses can be great, largely because of the sustained effects. Many diseases persist throughout the life of the stand, and in the case of root diseases, into subsequent rotations.

Root Diseases

Root diseases were among Montana's most damaging forest pests. They were especially common in the more productive grand fir and Douglas-fir stands in the northwestern part of the State. Root pathogens kill trees directly by attacking and killing the trees' root systems. They also predispose trees to insect attack and windthrow. Douglas-fir beetle, fir engraver beetle, western balsam bark beetle, and perhaps other Region 1 insects, infest and kill root disease-weakened trees in Montana.

Annual fluctuations in root disease associated tree mortality occur, apparently the result of drought stress and insect populations, and we have recently begun monitoring fluctuations in some stands. There appeared to be an increase in mortality in late summer of 1985, the result of a drought that occurred in the spring and early summer. Over the long term, root disease damage has increased.

Armillaria Root Disease

Armillaria root disease was widely distributed in Montana. Damage was most common and severe on the Flathead Indian Reservation and on the Lolo and Kootenai National Forests. Damage was locally severe on the Flathead, Helena, Bitterroot, and Lewis and Clark National Forests.

August rains resulted in abundant sporulation of the causal fungus. Fruiting bodies found on and near the Lolo National Forest (three stands) and the Kootenai National Forest (two stands) were tentatively identified as Armillaria ostoyae. Recent research in British Columbia and the State of Washington suggests A. ostoyae, not A. mellea, may be the cause of Armillaria root disease in those locations.

Observations suggest that Armillaria root disease has increased considerably during past decades as a result of timber harvest practices and fire control. Partial cutting and fire control have favored the regeneration and development of Douglas-fir and true fir understories on sites where those species are climax. Douglas-fir, grand fir, and subalpine fir are the conifer species most susceptible to the disease. The cutting of trees with root infections also promoted the buildup of the pathogen in the stumps enabling it to kill surrounding trees.

Yellow Laminated Root Rot

This disease, one of the most damaging of all forest pests in northern Idaho and the Pacific Northwest, also occurred in northwestern Montana. It was responsible for net losses of 50 percent or more in severely infested rotation-aged stands, losses that resulted from continuing mortality over the past few decades. It was especially prevalent in Douglas-fir and grand fir stands 40-80 years of age on the Lolo and Kootenai National Forests. Like Armillaria root disease, damage from laminated root rot has been increased by management actions that favor the more susceptible tree species and provide food bases in the form of stumps.

Schweinitzii Root and Butt Rot

The disease was found throughout most parts of Montana that were visited. It was a major cause of butt rot in old-growth conifers, primarily Douglas-fir. Damage also included windthrow, predisposition to Douglas-fir beetle, and direct killing by the pathogen. While some young-growth stands were affected, the overall trend may be toward gradually reduced losses as old-growth stands are brought under management and rotation lengths are reduced.

Annosus Root Disease

Annosus root disease was found to be widely distributed in Montana in 1985. Damaged stands were found on all Montana National Forests west of the Continental Divide, and on the Flathead Indian Reservation (Table 1). Increased findings were likely the result of more thorough diagnosis rather than a sudden increase of the disease. The disease occurred in ponderosa pine and Douglas-fir on drier sites, but was also present on Douglas-fir and true firs on cedar, grand fir, and subalpine habitat types. Since it often occurs in association with the much more easily diagnosed Armillaria root disease, we are unsure how much damage annosus root disease is causing. The disease trend is also unknown, but the disease is known to increase with tree cutting through stump infection. The pathogen's efficient means of long distance spread by way of airborne spores and stump infection has been well documented.

Table 1.—New records of annosus root disease in Montana in 1984 and 1985.

Location	Hosts[1]	Comments
McGregor Lake area (Champion Internat'l. Co.)	PP/DF SAF	Saplings, cutover stand Uncut stand
Yaak RD, Kootenai NF	GF	Saplings, cutover stand
Flathead Indian Reserv.	PP/DF	Seedlings-sawtimber, uneven-aged cutover stands
Clark Fork R. near Fish Cr.	PP	Saplings-sawtimber, cutover stands
Missoula RD, Lolo NF	PP	Saplings, cutover stands
Ninemile RD, Lolo NF	DF	Pole stand with PP overstory
Plains RD, Lolo NF	DF	Saplings in regenerated stands
Superior RD, Lolo NF	PP	Saplings-sawtimber, cutover
Big Fork RD, Flathead NF	DF	21-year-old plantation

[1]PP = ponderosa pine; DF = Douglas-fir; SAF = subalpine fir; GF = grand fir.

Black Stain Root Disease

This disease affected lodgepole pine, ponderosa pine, and Douglas-fir. It was found in 1985 on ponderosa pine in the Clark Fork Valley near Fish Creek. A group of about 25 pole-sized trees had been killed. The distribution of the disease, amount of damage it causes in Montana, and disease trends are unknown.

Root Disease Evaluations

Permanent Armillaria root disease evaluation plots in five precommercial stands were reexamined in 1985, 2 years after the plots were established. The average root disease-caused mortality rate over this period in diseased portions of the stands was 1.7 percent of the trees of all species per year. Additional plots in Montana and Idaho will be remeasured in 1986.

A 62-acre Armillaria root disease center and an adjacent nondiseased mature stand near Missoula were surveyed to compare timber productivity of the two stands. The disease center produced 81 percent less board foot volume per acre than the nondiseased stand. An effect of root disease was to produce an uneven-aged stand structure in place of an even-aged stand.

Dwarf Mistletoes

Annual dwarf mistletoe growth loss in Montana was estimated at 33 million cubic feet. These losses in Douglas-fir, lodgepole pine, and western larch occurred on about 2.4 million acres. Losses are being gradually reduced in managed stands as the parasite is eliminated or reduced to innocuous levels by regeneration cutting. Unfortunately, partial cutting has spread the pathogen and increased losses in many other stands.

Biological Evaluations

Dwarf mistletoe biological evaluations were conducted on 1,269 acres on four National Forests in 1985. Personnel from these four Forests made presuppression surveys on 2,100 acres, and carried out direct suppression on 1,019 acres (Table 2).

Table 2.--Area in acres on which dwarf mistletoe projects were completed on Montana National Forests in 1985.

National Forest	Biological evaluation	Presuppression surveys	Suppression
Bitterroot	551	700	551
Flathead	53	-	53
Gallatin	115	200	115
Lolo	550	1,200	300
TOTALS	1,269	2,100	1,019

Cooperative Forestry and Pest Management pathologists and Bureau of Indian Affairs foresters also developed a 5-year dwarf mistletoe plan for the Flathead Indian Reservation.

Dwarf Mistletoe Impact Evaluation

Permanent plots were established in 1970 and 1971 to measure the impact, spread, and intensification of dwarf mistletoe in precommercial Douglas-fir and lodgepole pine stands in Montana. The plots were remeasured in 1983 (DF) and 1984 (LP). Analyses indicate the following:

- Percent of the trees infected increased from 3.4 percent in 1970 to 9.2 percent in 1983 in Douglas-fir, and from 1.8 percent in 1971 to 7.4 percent in 1984 in lodgepole pine.

- Effects of dwarf mistletoe on tree diameter growth were not statistically significant.

The results were consistent with results from similar studies in other regions. Losses in lightly infected stands less than 30 years old are small. The stands will be remeasured every 5-10 years to monitor future effects.

Stem Diseases

White Pine Blister Rust

White pine blister rust continued to impact the management of white pine on many Montana white pine sites. Silvicultural controls have been developed that will allow lightly and moderately affected young growth to be brought to merchantable size. Rust-resistant planting stock is becoming more readily available.

Stem Rusts of Hard Pines

Damage from western gall rust and comandra blister rust was severe in localized areas. Both ponderosa pine and lodgepole pine were affected.

Stem Cankers

Atropellis canker was damaging in a number of sawtimber-sized lodgepole pine stands.

Severe branch killing has been observed on ponderosa pine in a number of places in western Montana during the past 4 years. This year it was particularly severe, perhaps as a result of the spring and early summer drought. Both young and mature pines were affected. Some trees have been killed. Diplodia blight was identified as the cause of damage in stands near Missoula and Polson, and is believed to be the cause at other locations. Engraver beetles have attacked and killed trees with severe cankers.

Lachnellula flavovirens was identified as the cause of a larch canker on the Hungry Horse Ranger District of the Flathead National Forest. About 50 percent of the trees were damaged in one stand that was 6-14 years old. Considerable top killing and tree mortality had occurred.

Foliage Diseases

Damage from foliage pathogens was greatly reduced in 1985 compared with the past few years. Larch needle blight, Meria needle cast, lodgepole pine needle cast, and Douglas-fir needle cast caused only locally severe defoliation. Larch needle blight was especially prevalent on the Ninemile District of the Lolo NF and on the east side of the Flathead Indian Reservation. Elytroderma disease was severe in ponderosa pine stands on the Flathead Indian Reservation.

Nursery Diseases

Fusarium Root Disease

Fusarium root disease was one of the major problems of containerized seedling production at the State nursery and several private nurseries in Montana in 1985. Most disease symptoms appeared near the end of the crop cycle when seedlings were hardened off prior to removal from the greenhouse. Fusaria were likely seedborne, but secondary sources of inoculum may also be important. The disease was most serious on Douglas-fir, but other species were also affected.

Grey Mold

Grey mold continued to be a serious problem of containerized conifer seedling production, particularly on western larch. Losses were reduced by fungicide applications and sanitation measures within greenhouses.

Caragana Canker

Fungi associated with cankers on caragana at the Montana State Nursery included mostly Alternaria and one species of Fusarium. Etiology of the disorder remains unknown.

Abiotic Disease

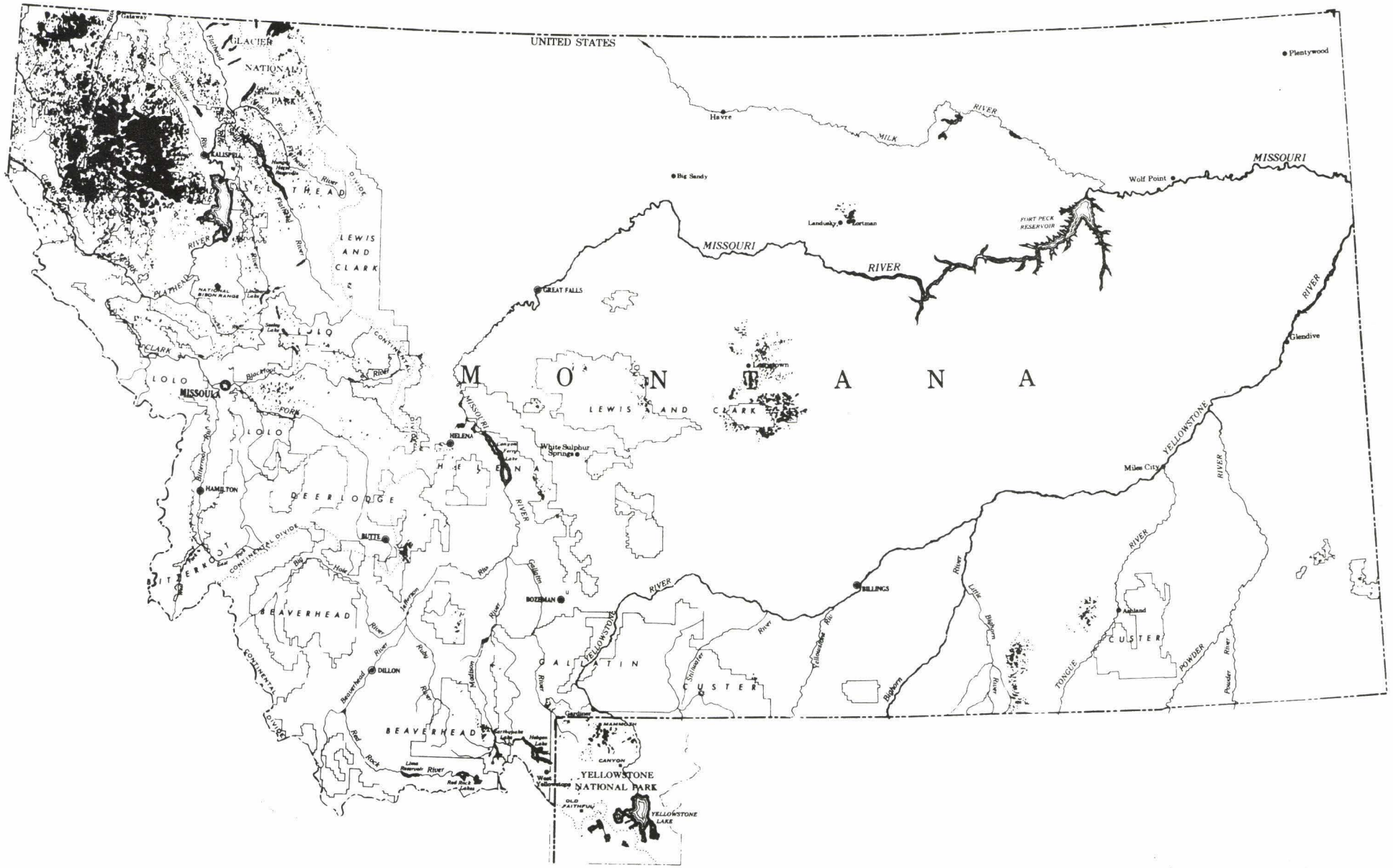
Mortality of Douglas-fir and ponderosa pine seedlings was observed on south- and west-facing slopes in the Missoula area. The damage was attributed to the 1985 spring drought in Montana.

INSECTS

Bark Beetles

Mountain Pine Beetle

Mountain pine beetle losses continued to be significant in Montana on all ownerships (see map). Some of the older outbreak areas in lodgepole pine are declining because many of the susceptible stands have been killed. Most of the lodgepole pine acreage affected is in or adjacent to the Flathead, Kootenai, and Lolo National Forests. A new outbreak area is being monitored closely on the Deerlodge Natonal Forest east of Butte. Acres of infested lodgepole pine on National Forests decreased from 679,724 in 1984, to 519,031 in 1985 (Table 3). This decline is also reflected in whitebark pine, ponderosa pine, and western white pine. Acres of infested lodgepole pine in National Parks also declined from 123,184 acres in 1984, to 19,297 acres in 1985. Total Federal lands with infested host was 588,545 acres in 1985.



Areas of mountain pine beetle infestations in Montana and Yellowstone National Park, 1985

Table 3.—Acres of mountain pine beetle infestation on Federal lands in Montana and Yellowstone National Park, 1984 and 1985.

Ownership	1984				1985			
	LPP[1/]	WBP	PP	WWP	LPP	WBP	PP	WWP
Beaverhead NF	27,448	3,160	-	-	4,177	-	-	-
Bitterroot NF	-	-	1,666	-	0	-	955	-
Custer NF	4	229	1,158	-	1	1	215	-
Deerlodge NF	6,548	-	-	-	4,963	-	-	-
Flathead NF	76,091	1,006	15	1,234	124,950	2,318	3,538	1,547
Gallatin NF	151,160	8,301	-	-	2/	2/	2/	2/
Helena NF	2,043	-	91	-	1,342	48	211	-
Kootenai NF	372,966	303	3,411	659	363,398	202	12,326	970
Lewis & Clark NF	96	100	864	-	67	-	5,825	-
Lolo NF	39,359	2,309	2,120	423	20,136	1,114	1,247	1
Glacier NP	17,620	5	-	-	12,412	157	1	58
Yellowstone NP	105,564	934	-	-	6,885	44	-	-
Blackfeet IR	8,721	-	-	-	4,188	10	-	-
Crow IR	-	-	1,247	-	-	-	5,717	-
Flathead IR	915	-	1,223	-	1,923	139	1,825	-
Ft. Belknap IR	1,325	-	8	-	-	-	925	-
N. Cheyenne IR	-	-	3,313	-	-	-	2,166	-
Rocky Boy's IR	336	-	-	-	-	-	-	-
BLM	3,364	436	-	-	29		2,491	-
			TOTALS					
National Forests	675,715	15,408	9,325	2,316	519,034	3,683	24,317	2,545
National Parks	123,184	939	-	-	19,297	201	1	58
Indian Reserv.	11,297	-	5,791	-	6,111	149	10,633	-
BLM	3,364	436	-	-	29	-	2,491	-
All Federal	813,560	16,783	15,116	2,316	544,471	4,033	37,442	2,603

1/ LPP = lodgepole pine; WBP = whitebark pine; PP = ponderosa pine; WWP = western white pine.

2/ Forest did not request 1985 survey.

Acres of mountain pine beetle infestations in all host types on State and private lands in Montana decreased from 450,833 acres in 1984, to 347,145 acres in 1985. The bulk of the infested area was lodgepole pine, with 303,727 acres affected (Table 4). The Flathead and Kootenai reporting areas were most impacted. Infestations in ponderosa pine increased in 1985 with 42,887 acres affected compared to 29,778 acres in 1984. Most of this increase was on the Lewis and Clark reporting area.

Table 4.—Acres of mountain pine beetle infestation on State and private lands in Montana, 1984 and 1985.

Reporting area	1984				1985			
	LPP[1]	WBP	PP	WWP	LPP	WBP	PP	WWP
Beaverhead	7,519	112	-	-	278	-	-	-
Bitterroot	-	-	2,413	-	-	-	666	-
Custer	205	272	272	-	5	110	184	-
Deerlodge	245	-	-	-	21	-	-	-
Flathead	94,033	-	13,567	13	100,550	1	9,001	316
Gallatin[2]	63,648	5,110	-	-	-	-	-	-
Garnets	11	-	3,343	-	374	-	2,948	-
Helena	841	-	176	-	189	-	581	-
Kootenai	224,311	-	6,567	14	191,581	60	8,893	9
Lewis & Clark	183	-	432	-	1	-	19,726	-
Lolo	8,853	10	1,897	85	10,057	1	714	-
Stillwater SF[2]	1,214	121	1	-	-	-	-	-
Swan SF	2,730	-	461	-	12	6	1	28
Thompson R. SF	11,524	-	649	1	659	-	173	-
TOTALS	415,317	5,625	29,778	113	303,727	178	42,887	353

[1] LPP = lodgepole pine; WBP = whitebark pine; PP = ponderosa pine; WWP = western white pine.

[2] Not surveyed in 1985.

Beaverhead Reporting Area - This outbreak is on the decline. Only 4,177 acres of infested lodgepole pine on National Forest land were detected in 1985. There is, however, a possible outbreak starting in the Wise River Ranger District. Infestations on State and private lands in the Beaverhead reporting area decreased dramatically from 7,519 acres in 1984, to 278 acres in 1985.

Bitterroot Reporting Area - There was a slight decline of infested ponderosa pine areas on National Forest lands in 1985. In 1984, it was reported that 4,006 acres of damaged lodgepole pine were detected. This outbreak actually occurred on the portion of the West Fork Ranger District that is in Idaho. The administrative office is in Montana.

State and private land affected by mountain pine beetle decreased to 666 acres in 1985, down from 2,413 acres in 1984. All of the affected acreage was ponderosa pine, located mostly in the Sula State Forest area.

Custer Reporting Area - Infested acres of ponderosa pine decreased on National Forest lands. In 1985 there were only 215 acres compared to 1,158 acres infested in 1984.

State and private acreage affected decreased by more than half in 1985. Only 299 acres of all host types were infested.

Deerlodge Reporting Area - Detection surveys showed a slight decline in infested lodgepole pine acreage on federal lands in 1985. This outbreak is expected to continue because there is suitable host near this new outbreak area.

Only 21 acres of State and private lands in the Deerlodge reporting area were affected, all of which were lodgepole pine.

Flathead Reporting Area - Mountain pine beetle infested acres of lodgepole pine on National Forest ownership increased in 1985 to 124,950 acres, compared to 76,091 in 1984. Increases were also noted in other host species. Most of the increase was recorded on National Forest ownerships south of Kalispell.

Infestations on State and private lands in lodgepole pine increased from 94,033 acres in 1984, to 100,550 acres in 1985. Areas affected most were near Little Bitterroot and McGregor Lakes southwest of Kalispell.

Garnets Reporting Area - Acres of ponderosa pine on State and private ownerships affected by the beetles remained about the same as in 1984. Most of the activity was in the Blackfoot River drainage near Potomac and Greenough.

Helena Reporting Area - There was little change in infested lodgepole pine acreage from 1984. There were 1,342 acres detected in 1985 on National Forest lands. Only 211 acres of ponderosa pine were infested in 1985. Beetle activity on State and private lands in this reporting area also remained relatively low.

Kootenai Reporting Area - Infested lodgepole pine acres continued to be at a high level on National Forest lands. In 1985, there were 363,398 acres of lodgepole pine infested. Some decline in other host species was observed in 1985. Most of the area affected was near the Kookanusa Lake area.

Major damage on State and private lands in the Kootenai reporting area continued to be in Pleasant Valley and the Fisher River drainage. Acres of lodgepole pine infested decreased from 224,311 in 1984, to 191,581 in 1985. The acreage of ponderosa pine infested increased to 8,893 in 1985, up from 6,567 in 1984.

Lewis and Clark Reporting Area - There was a substantial increase in ponderosa pine infested acres of National Forest lands in 1985. A total of 5,825 acres were observed from detection surveys. This compares to 864 acres in 1984. Only 67 acres of infested lodgepole pine were detected in 1985.

Mountain pine beetle infestations in ponderosa pine on State and private ownerships in the Lewis and Clark reporting area also increased markedly from 432 acres in 1984, to 19,726 acres in 1985. Areas mostly affected were the Judith Mountains, Moccasin Mountains, and the Big and Little Snowy Mountains in the Lewistown area.

Lolo Reporting Area - A slight decline was noticed in lodgepole pine infested acres in 1985 with 20,136 acres detected on federal lands. Other host species also showed a decline.

An increase in infested lodgepole pine on State and private lands was observed with 10,057 acres infested in 1985 compared to 8,853 acres in 1984. Acres of infested ponderosa pine decreased from 1,897 in 1984, to 714 in 1985.

Glacier National Park Reporting Area - Mountain pine beetle infested stands are confined to the east side of Glacier National Park in the lodgepole pine type where 12,412 acres were detected. This outbreak is expected to decline in 1986.

Yellowstone National Park Reporting Area - The infestation in lodgepole pine stands continued to decline. Only 6,885 acres were detected in 1985. Most of the susceptible stands have been eliminated by the mountain pine beetle, and it is confined to pockets at the higher elevations.

Blackfeet Indian Reservation Reporting Area - This outbreak area has declined to 4,188 acres in 1985 compared to 8,721 acres in 1984. This area should continue to decline.

Northern Cheyenne Indian Reservation Reporting Area - Ponderosa pine trees continued to be killed in 1985 where 2,166 acres of infestation were observed.

Rocky Boy's Indian Reservation Reporting Area - Detection surveys were not conducted in this area in 1985.

BLM Lands in Montana - Infested lodgepole pine stands declined in 1984 with 29 acres recorded. This year 4,194 acres were recorded. There was an increase in ponderosa pine stands infested in 1985 when 2,491 acres were observed.

Spruce Beetle

Spruce beetle infestation levels continued to decline in 1985. Acres of federal lands affected in 1985 were 4,407 (Table 5). Only 13 acres of spruce beetle infestation were detected on State and private lands (Table 6), though this figure would have probably been higher had the Stillwater State Forest reporting area been surveyed in 1985.

Table 5.--Acres of bark beetle infestations (other than mountain pine beetle) on federal lands in Montana and Yellowstone National Park, 1984.

Ownership	Douglas-fir beetle	Douglas-fir engraver	Western balsam bark beetle	Pine engraver	Spruce beetle
Beaverhead NF	1		200	1	
Bitterroot NF	214				
Custer NF	-		1		
Deerlodge NF	40				
Flathead NF	1,387		888		3,304
Gallatin NF					
Helena NF					
Kootenai NF	143		21	20	203
Lewis & Clark NF					
Lolo NF	218		1,041		4
Glacier NP	292		65		896
Yellowstone NP	2		67		
Blackfeet IR			2		
Flathead IR	5		36		
Ft. Belknap IR					
N. Cheyenne IR					
BLM	2		365		
TOTALS	2,304	0	2,686	21	4,407

Table 6.--Acres of bark beetle infestations (other than mountain pine beetle) on State and private lands in Montana, 1985.

Ownership	Douglas-fir beetle	Western balsam bark beetle	Pine engraver	Spruce beetle
Beaverhead	-	46	-	-
Bitterroot	22	-	-	-
Custer	-	-	-	-
Deerlodge	20	-	-	-
Flathead[1]	80	4	1	13
Gallatin[1]	-	-	-	-
Garnets	2	20	-	-
Helena	-	-	-	-
Kootenai	71	-	90	-
Lewis & Clark	-	-	-	-
Lolo	11	67	3	-
Stillwater SF[1]	-	-	-	-
Swan R. SF	111	60	-	-
Thompson R. SF	-	-	-	-
TOTALS	317	197	94	13

[1]Not flown in 1985.

Douglas-fir Beetle

A significant decline in Douglas-fir beetle was noticed on federal lands in 1985 when 2,304 acres were detected. Most of the outbreak was confined to the Flathead National Forest. State and private lands infested with Douglas-fir beetle decreased from 1,208 acres in 1984 to 317 acres in 1985.

Western Balsam Bark Beetle

Damage caused by the western balsam bark beetle declined to 2,686 acres on federal lands in 1985 (Table 5). There were 11,387 acres reported in 1984. Balsam bark beetle damage on State and private lands also declined in 1985. Only 197 acres of infestation were recorded.

Pine Engraver

There were only 21 acres of pine engraver mortality reported on federal lands from the aerial survey in 1985 (Table 5). This was down from 689 acres in 1984. Aerial surveys recorded 94 acres of pine engraver damage on State and private lands in 1985.

However, these figures do not reflect the pine engraver damage that occurred in 1985. The drought during July 1985 was favorable for populations of pine engraver beetles to build up in stands of ponderosa pines. "Group killing" did not start to be conspicuous until mid-September in Montana--well after the

aerial survey season. Some of the heaviest damage was noticed along the Clark Fork and Blackfoot River drainages in western Montana. The Garnet Mountains also contained hundreds of groups. Snow breakage caused a buildup of this beetle on the Sioux Ranger District, Custer National Forest.

Defoliators

Western Spruce Budworm

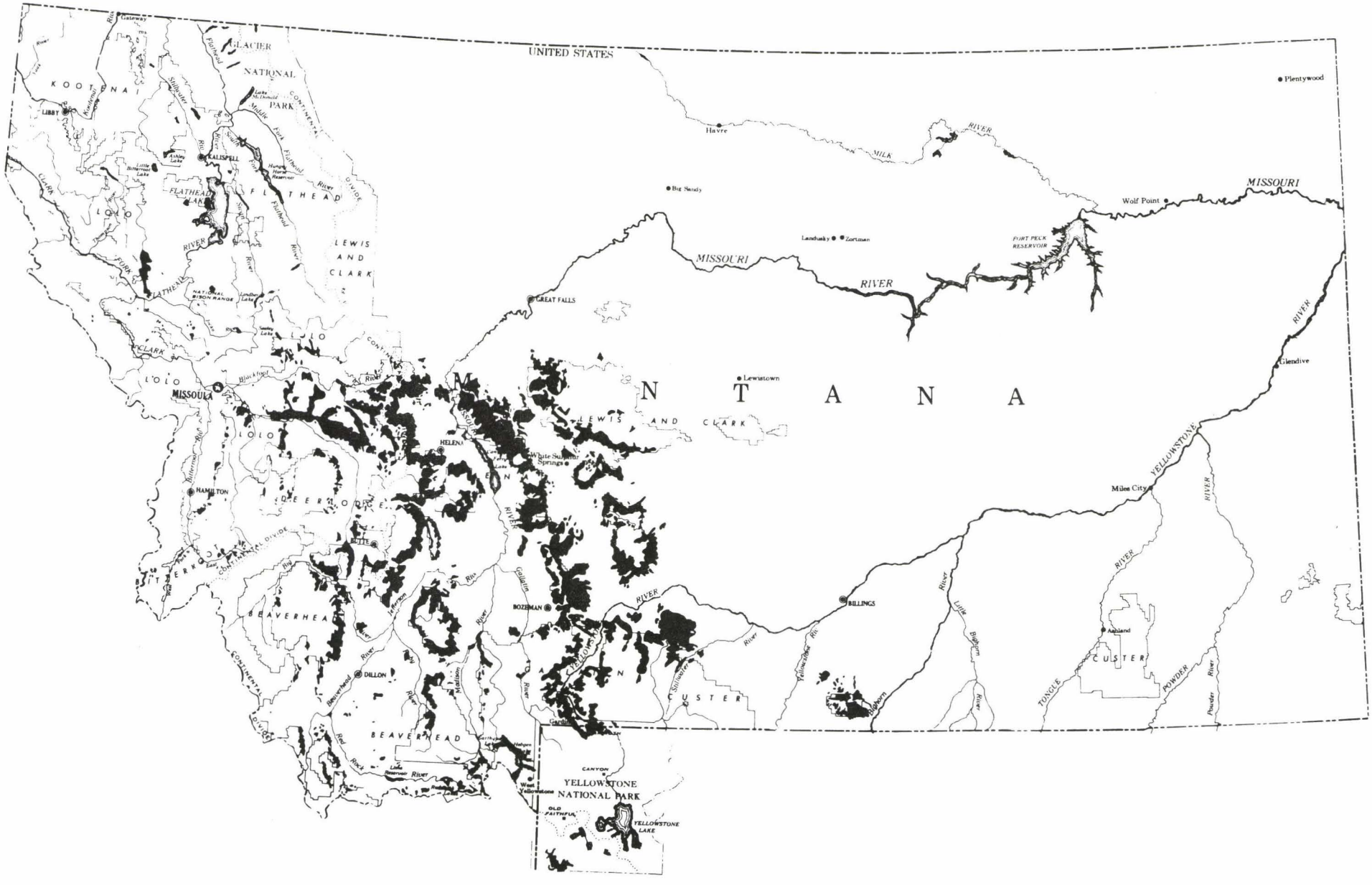
There was an increase in acres with visible defoliation caused by western spruce budworm in 1985 on all ownerships in Montana (see map), where 2.7 million acres were observed (Table 7). Most of the defoliation occurred on the east side Forests. The Gallatin National Forest was not flown in 1985 but the infestation still persisted and 1984 figures were used for 1985.

Observations on the silvicultural demonstration areas showed that the infestation was still light in the general area, and that all blocks were defoliated at about the same degree. These areas will continue to be monitored in 1986.

Table 7.--Acres of aerially visible western spruce budworm defoliation on all ownerships in Montana and Yellowstone National Park, 1984 and 1985.

	Total acres		1985 acres by ownership				
	All ownerships		National	Nat'l.			State &
	1984	1985	Forest	Park	BIA	BLM	private
BVHD	345,650	337,157	189,903			78,674	68,580
BTRT	20,959	25,106	15,102				10,004
CUST	94,734	90,550	74,732			5,236	10,582
DLGE	322,467	326,375	182,293			32,951	111,131
FLHD	0	6,295[1]					6,295
GALL	574,165	574,165[1]	311,555				262,610
HLNA	581,372	757,039	371,717			45,837	339,485
L&C	206,104	281,111	181,093			5,616	94,402
LOLO	63,651	40,664	18,580			1,514	20,570
Garnets	23,229	185,347				28,605	156,742
FLHD IR	1,750	35,329			35,329		
Crow IR	14,398	15,445			15,445		
Yellow-stone NP	52,283	29,155		29,155			
TOTAL	2,300,762	2,703,738	1,344,975	29,155	50,774	198,433	1,080,401

[1] Not flown in 1985; used 1984 data.



Western spruce budworm defoliation visible from the air in Montana and Yellowstone National Park, 1985

Douglas-fir Tussock Moth

Adult male moth catches from the 33 permanent pheromone trapping plots in western Montana indicated low tussock moth population levels again in 1985. Trap catches at only one plot (Pistol Creek, south of St. Ignatius) were higher than 25 moths average per trap.

Pine Needle Sheathminer

Defoliation by this moth has been increasing for the past several years in pine stands throughout Montana. In 1985, the largest area of defoliation was on the Custer National Forest along the Stillwater River. This drainage contained 10,852 acres of lodgepole and limber pines which were heavily damaged. On the Flathead National Forest, some 15- to 20-acre patches of lodgepole pine trees were heavily defoliated north of Columbia Falls. In addition, almost all lodgepole pine stands in the northern half of the Flathead National Forest and west side of Glacier National Park contained light to moderate damage. Damage could also be detected in ponderosa pine stands extending south through the Flathead Valley to Evaro Pass. The Clark Fork Valley from Missoula to Superior had areas of ponderosa pine that were heavily infested with needle sheathminer. Lodgepole pine stands in the Boulder River drainage on the Gallatin National Forest were also heavily defoliated.

Larch Budmoth

Defoliation in western larch stands was detected in northwestern Montana during 1983. Damage decreased somewhat in 1984 and was mixed with that caused by the larch casebearer. In 1985, the outbreak spread, and defoliation was conspicuous on 151,689 acres in northwestern Montana. This damage was distributed on the Flathead National Forest where 46,795 acres were defoliated; on the Kootenai National Forest 103,265 acres were defoliated; on the Stillwater River State Forest 1,469 acres were defoliated; and on the Flathead Indian Reservation 160 acres were defoliated.

Forest Tent Caterpillar

This periodic pest of hardwoods and shrubs defoliated alders, birches, willows, and aspens along the south end of Flathead Lake in 1985. It also infested ornamental shrubs, trees, and fruit trees in Missoula.

Pine Looper

The last pine looper outbreak occurred in eastern Montana from 1969 to 1972. In 1985, very heavy defoliation caused by the pine looper was detected in about 3,200 acres of ponderosa pine trees in the Ekalaka Hills, Custer National Forest. District personnel reported seeing this pest in the southwestern portion of the Hills in 1984. An evaluation made in late October 1985 showed a very low population of overwintering pupae. This indicates that damage will probably be very light in 1986.

Western Pine Tip Moth

Heavy damage by this moth was last reported in eastern Montana during the late 1950's and early 1960's. During October 1985, heavy tip kill was detected in more than 66,000 acres of ponderosa pine stands within the Ekalaka Hills and Long Pines areas on the Sioux Ranger District, Custer National Forest. Damage may continue during 1986.

COOPERATIVE TRAINING

The Montana Department of State Lands and USDA Forest Service, Northern Region, conduct training programs to assist field-going personnel and forest managers in detection, identification, and management of forest pests. The training program consists of two parts: basic sessions in which field identification and life cycles of pests are emphasized, and advanced sessions where management alternatives are discussed. The basic session is designed for field-oriented personnel such as stand exam crews. The advanced session is for silviculturists and others involved in developing silvicultural prescriptions.

In 1985, a basic session was held in Kalispell, and an advanced session in Missoula. In 1986, a basic session will be held June 18-19 in Missoula and advanced sessions September 16-18 in Bozeman and October 7-9 in Kalispell.

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COMMON AND SCIENTIFIC NAMES

Insects

Douglas-fir beetle	*Dendroctonus pseudotsugae* Hopkins
Douglas-fir tussock moth	*Orgyia pseudotsugata* (McDunnough)
Fir engraver	*Scolytus ventralis* (LeConte)
Forest tent caterpillar	*Malacosoma disstria* Hubner
Larch budmoth	*Zieraphera improbana* (Walker)
Larch casebearer	*Coleophora laricella* (Hubner)
Mountain pine beetle	*Dendroctonus ponderosae* Hopkins
Pine engraver	*Ips pini* (Say)
Pine looper	*Phaeoura mexicanaria* (Grote)
Pine needle sheathminer	*Zelleria haimbachi* Busck
Spruce beetle	*Dendroctonus rufipennis* (Kirby)
Western balsam bark beetle	*Dryocoetes confusus* Swaine
Western pine tip moth	*Rhyacionia bushnelli* (Busck)
Western spruce budworm	*Choristoneura occidentalis* Freeman

Diseases

Annosus root disease	*Heterobasidion annosum* (Fr.) Bref.
Armillaria root disease	*Armillaria mellea* (Vah. ex. Fr.)
Atropellis canker	*Atropellis piniphila* (Weir) Lohman & Cash
Black stain root disease	*Verticicladiella wageneri* Kend.
Brown cubical root and butt rot	*Phaeolus schweinitzii* (Fr.) Pat.
Comandra blister rust	*Cronartium comandrae* Peck.
Damping-off	*Fusarium* sp.; *Pythium* sp.
Diplodia blight	*Sphaeropsis sapinea* (Fr.) Dyko & Sutton
Dwarf mistletoes	*Arceuthobium* sp.
Elytroderma disease	*Elytroderma deformans* (Weir) Darker
Fusarium root disease	*Fusarium* spp.
Grey mold	*Botrytis cinerea* Pers. ex Fr.
Hypodermella needle blight	*Hypodermella laricis* Tub.
Laminated root rot	*Phellinus weirii* (Murr.) Gilb.
Larch canker	*Lachnellula flavovirens* (Bres.) Dennis
Larch needle blight	*Hypodermella laricis* Tub.
Larch needle cast	*Meria laricis* Vuill.
Douglas-fir needle cast	*Rhabdocline pseudotsugae* Syd. and *R. weirii* Parker & Reid
Western gall rust	*Endocronartium harknessii* (J.P. Moore) Y. Hirat.
White pine blister rust	*Cronartium ribicola* Fish. ex. Rabh.

RECENT PUBLICATIONS

Amman, G. D., M. D. McGregor, and R. E. Dolph, Jr. 1985. Mountain pine beetle. Forest Insect and Disease Leaflet 2. USDA Forest Service. Revised. 11 p.

Bousfield, W. E., R. G. Eder, and D. D. Bennett. 1985. Users guide and documentation for insect and disease survey (INDIDS). USDA Forest Service, Northern Region. Rept. 85-19. 19 p.

Byler, J. W., C. A. Stewart, and L. D. Hall. 1985. Establishment report: Permanent plots to evaluate the effect of Armillaria root disease in precommercially thinned stands. USDA Forest Service, Northern Region. Rept. 85-21. 12 p.

Cole, W. E., and M. D. McGregor. 1985. Reducing/preventing mountain pine beetle outbreaks in lodgepole pine stands by selection cutting. In: Safranyik, Les and Alan Berryman, ed. The role of host-pest interaction in the population dynamics of forest insects: Proceedings of the IUFRO Working Parties S2-07-05-06 Symposium. September 4-7, 1983. Banff, Alberta; Canada. pp. 175-178.

Dewey, J. E. 1985. Western spruce budworm impact on Douglas-fir cone production. Proceedings, Symposium: Conifer tree seed in the inland mountain west. Intermountain Forest and Range Experiment Station, Odgen, Utah.

Dewey, J. E., R. L. Livingston, and S. Kohler. 1985. Douglas-fir tussock moth population surveys - northern Idaho and western Montana - 1983 and 1984. USDA Forest Service, Northern Region. Rept. 85-10. 12 p.

Dewey, J. E., R. L. Livingston, S. Kohler, and C. Sartwell. 1985. Control of the western pine shoot borer, Eucosma sonomana Kearfott, in selected ponderosa pine plantations in northern Idaho and western Montana. Progress Rept. No. 2. USDA Forest Service, Northern Region. Rept. 85-22. 6 p.

Gibson, K. E. 1985. Permanent mountain pine beetle population trend plots: An update, 1985. USDA Forest Service, Northern Region, Rept. 85-14. 8 p.

Gibson, K. E., and D. D. Bennett. 1985. Carbaryl prevents attacks on lodgepole pine by the mountain pine beetle. Journal of Forestry 83(2):109-112.

Gibson, K. E., and O. J. Dooling. 1985. Status of insects and diseases on eastside National Forests and adjoining State and private lands - 1984. USDA Forest Service, Northern Region. Rept. 85-16. 6 p.

Hagle, S. K. 1985. Assessing forest disease impact in Region One. A new direction. Proceedings of 32nd Western International Forest Disease Work Conference. Taos, New Mexico. September 25-28, 1984. pp. 29-34.

Hagle, S. K. 1985. Monitoring root disease mortality. USDA Forest Service, Northern Region. Rept. 85-17. 13 p.

Haverty, M. I., P. J. Shea, and L. E. Stipe. In press. Single and multiple applications of Fenvalerate to protect western white pine cones from Dioryctria abietinorella (Lepidoptera Pyrolidae). Journal of Economic Entomology.

Hawksworth, F. G., and O. J. Dooling. 1984. Lodgepole pine dwarf mistletoe. USDA Forest Service. Forest Insect and Disease Leaflet No. 18. 11 p.

James, R. L. 1985. Containerized western white pine seedling mortality at the Bonners Ferry Ranger District, Idaho Panhandle National Forests. USDA Forest Service, Northern Region. Rept. 85-18. 7 p.

James, R. L. 1985. Diseases associated with containerized seedling soil mixes. Tree Planters' Notes 36(2):3-5.

James, R. L. 1985. Meria needle cast of western larch seedlings at the USDA Forest Service Nursery, Coeur d'Alene, Idaho. USDA Forest Service, Northern Region. Rept. 85-20. 6 p.

James, R. L. 1985. Studies of Fusarium associated with containerized conifer seedling diseases: (2) Diseases of western larch, Douglas-fir, grand fir, subalpine fir, and ponderosa pine seedlings at the USDA Forest Service Nursery, Coeur d'Alene, Idaho. USDA Forest Service, Northern Region. Rept. 85-12. 7 p.

James, R. L., and C. J. Gilligan. 1985. Containerized Engelmann spruce seedling diseases at the USDA Forest Service Nursery, Coeur d'Alene, Idaho. USDA Forest Service, Northern Region. Rept. 85-17. 15 p.

James, R. L., and C. J. Gilligan. 1985. Resistance of Botrytis cinerea to vinclozolin, iprodione, and dicloram. USDA Forest Service, Northern Region. Rept. 85-3. 22 p.

James, R. L., S. Tunnock, R. L. Livingston, J. W. Schwandt, D. P. Beckman, and K. A. Knapp. 1984. Idaho pest conditions and program summary. USDA Forest Service, Northern Region, Idaho Dept. of Lands. Rept. 85-1. 35 p.

Kohler, O. J. Dooling, and W. E. Bousfield. 1985. Montana forest pest conditions and program highlights 1984. USDA Forest Service, Northern Region; Montana Dept. State Lands. Rept. 85-2. 23 p.

McGregor, M. D. 1985. The conflict between people and the beetle. In: Loomis, R. L.; Tucker, S.; Hofaker, T. H., eds. Insect and disease conditions in the United States - 1979-1983. USDA Forest Service. Rept. GTR WO-46. 8 p.

McGregor, M. D., and D. M. Cole. 1985. Integrating management strategies for the mountain pine beetle with multiple resource management of lodgepole pine stands. USDA Forest Service, Intermountain Forest and Range Experiment Station. Rept. GTR-174. 68 p.

McGregor, M. D., K. E. Gibson, S. Tunnock, L. E. Stipe, H. E. Meyer, and R. D. Oakes. 1985. Status of mountain pine beetle infestations, Northern Region, 1984. USDA Forest Service, Northern Region. Rept. 85-25. 36 p.

McGregor, M. D., R. D. Oakes, and H. E. Meyer. 1985. Evaluation of Douglas-fir mortality from Douglas-fir beetle from 1982-1984 following MCH application. USDA Forest Service, Northern Region. Rept. 85-7. 9 p.

McGregor, M. D., W. E. Bousfield, R. L. James, and R. G. Eder. 1985. Insects and diseases of the Bridger-Derby, Deer Creek, and Iron Mountian management units, Big Timber Ranger District, Gallatin National Forest. USDA Forest Service, Northern Region. Rept. 85-15. 13 p.

Stipe, L. E., and J. E. Dewey. 1985. Protecting Douglas-fir cones and foliage with systemic insecticide. USDA Forest Service, Northern Region. Rept. 85-6. 21 p.

Tunnock, S. 1985. Evaluation of a hemlock sawfly outbreak in the northern tip of Idaho - 1985. USDA Forest Service, Northern Region. Rept. 85-26. 4 p.

Tunnock, S., and R. B. Ryan. 1985. Larch casebearer in western larch. USDA Forest Service, Forest Insect and Disease Leaflet No. 96, Washington, D.C. 8 p.

Tunnock, S., and W. E. Bousfield. 1985. Evaluation of larch casebearer parasites on the Flathead National Forest, Montana - 1985. USDA Forest Service, Northern Region. Rept. 85-24. 4 p.